NISAC
Urban Infrastructure Suite—Transportation Sector: The TRANSIMS Module

The National Infrastructure Simulation and Analysis Center (NISAC) provides advanced modeling and simulation capabilities for the analysis of critical infrastructures and their interdependencies, vulnerabilities, and complexities. These capabilities help improve the robustness of our nation's critical infrastructures by aiding decision makers in the areas of policy analysis, investment and mitigation planning, education and training, and near real-time assistance to crisis response organizations.

The Department of Homeland Security's (DHS) Information Analysis and Infrastructure Protection (IAIP) Directorate sponsors the NISAC program. NISAC is a core partnership of Sandia National Laboratories (SNL) and Los Alamos National Laboratory (LANL). NISAC integrates the two laboratories' existing expertise in modeling and simulation to address the nation's potential vulnerabilities and the consequences of disruption among our critical infrastructures.

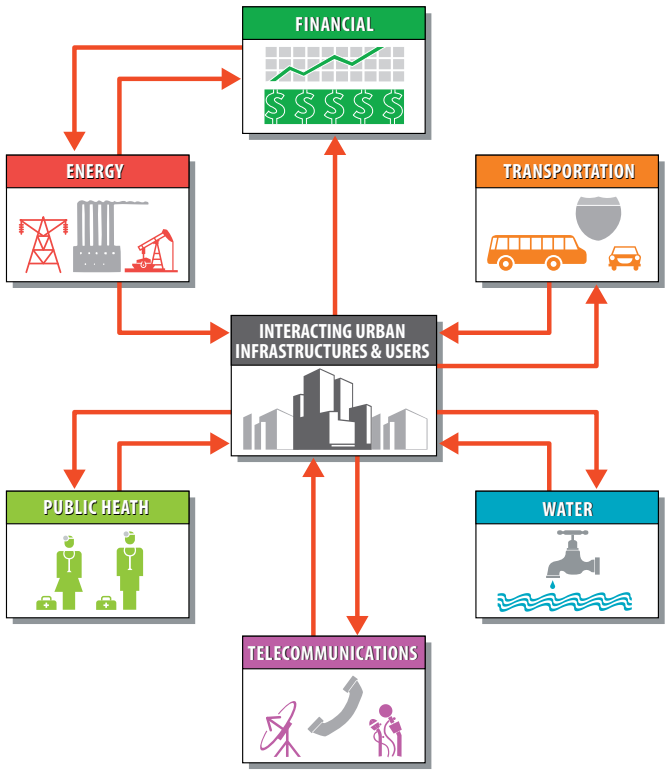
The Urban Infrastructure Suite (UIS) is a set of seven interoperable modules that employ advanced modeling and simulation methodologies to represent urban infrastructures and populations. (See figure at right.) These simulation-based modules are linked to model urban transportation, telecommunications, public health, energy, financial (commodity markets), and water-distribution infrastructures and their interdependencies.

The Transportation Analysis Simulation System (TRANSIMS) Module simulates the daily activities and movements of individuals in an urban region. The individuals are synthetic—they do not represent actual people—but a census taken on the entire synthetic population would be statistically identical to the actual census.

On the other hand, the locations visited by individuals are real street addresses and reflect actual land-use patterns in the region.

TRANSIMS provides the following information about the synthetic population and its mobility:

- Household structure and demographics;
- Activity locations, times, and durations; and
- Trips between activities, including route plans and execution of the route plans on the transportation network.



The relationships between TRANSIMS (in orange) and the other UIS modules.

TRANSIMS provides information about the built urban environment.

TRANSIMS also provides information about the built urban environment, such as the locations of hospitals, schools, homes, offices, airports, and ports.

TRANSIMS shares population-mobility information with other UIS sector simulations, which require this information to construct social contacts relevant to the public health sector, to generate electrical and water-demand profiles for buildings, and to determine the origin and destination of calls in the telecommunications sector.

TRANSIMS provides decision makers with information about the effects of infrastructure changes on the movements and activities of the population.

Key Features. TRANSIMS creates a synthetic population for an urban area using census and survey data. TRANSIMS computes activity times and locations for each individual and maintains individual identities during route planning and traffic microsimulations on the transportation network. The identities of individuals are maintained throughout the simulation and analysis architecture of the entire UIS.

The transportation network includes highways, streets, transit stops, parking lots, and transit lines; the network is essential to the generation of population-mobility data. TRANSIMS also employs land-use information such as residential, work, shopping, and recreational locations, which are required for realistic population-mobility information in any urban area.

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